

1. Find the Laplace transform of

$$f(t) = \begin{cases} t + 2, & 0 \leq t \leq 1 \\ 3, & t > 1 \end{cases}$$

2. Determine

$$\mathcal{L}^{-1} \left\{ \frac{s}{s^2 - 4s + 14} \right\}$$

3. Determine

$$\mathcal{L} \{ t^2 \cos(2t) \}$$

4. Determine

$$\mathcal{L}^{-1} \left\{ \frac{s + 9}{(s^2 + 8s + 20)^2} \right\}$$

5. Solve using the Laplace transform:

$$y'' + 3y' + 2y = 3e^{-2t}, \quad y(0) = 2, \quad y'(0) = 1$$

6. Determine $\mathcal{L}\{f(t)\}$ where $f(t) = U(t - 3) \sin(2t - 3)$.

7. Determine

$$\mathcal{L}^{-1} \left\{ \frac{e^{-4s}}{s^2 + 8s + 12} \right\}$$

8. Solve using the Laplace transform:

$$y'' + 4y = \sin(t) - U(t - 2\pi) \sin(t), \quad y(0) = 0, \quad y'(0) = 0$$